Optimal Operation and Management of Energy Storage Systems Based on Real time Predictive Modeling and Adaptive Battery Management Techniques

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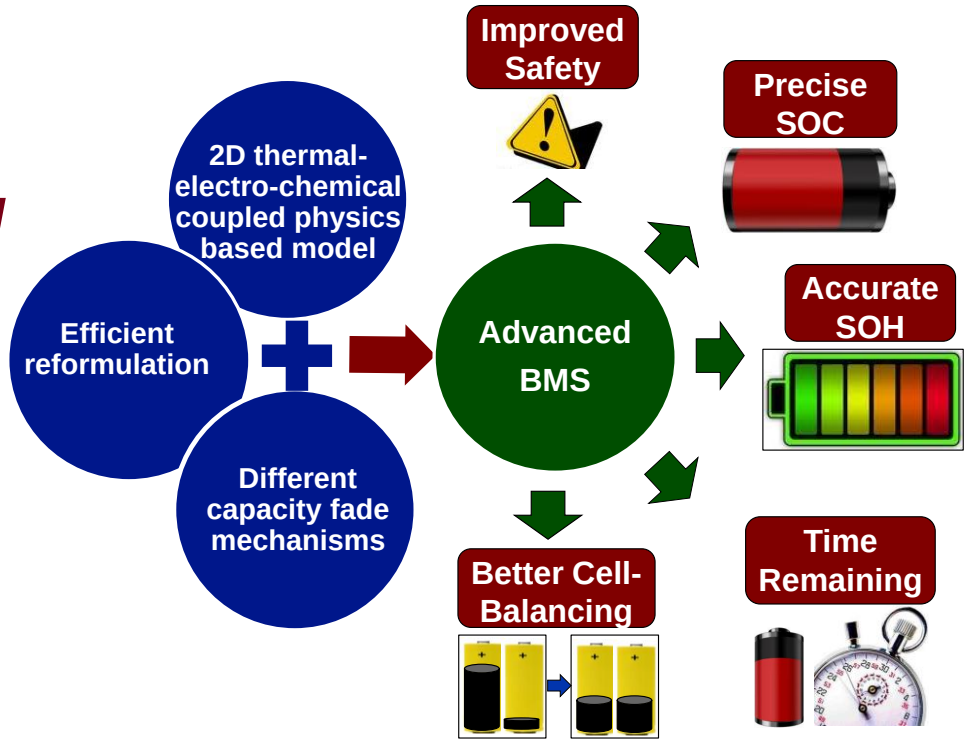
Technology

- **2D thermal-electrochemical coupled models with capacity fade mechanisms integrated into BMS**
- **BMS based on *fastest* and *detailed* physics based models**
- **Demonstrate improvements in safety, performance, and battery lifetime.**



Value Proposition and Differentiation

- **Advanced BMS to enable less battery footprint.**
- **Estimation of internal states and parameters in real time will give complete knowledge of underlying system and improve safety**
- **Enable accurate SOC and SOH prediction**
- **Calculation and implementation of optimal battery operating conditions**
- ***Pushing* the limit of simulation capability and model predictability**
- ***Pushing* the limit of state estimation efficiency and accuracy.**

Metrics	State of the Art	Proposed Metric
1D EC model	~1 min	~30 ms
Pseudo 2D EC model	1-2 min	~100 ms
2D Thermal EC coupled	~15 min	< 5 s
Models for BMS	Circuit based/ Empirical	Detailed 2D, thermal-EC model with capacity fade

Performance Targets and Validation

- **Integration of microcontroller with physics-based control models onto a large format cell and to demonstrate**
  - **i) a 20% reduction in the weight of the cell**
  - **ii) a 50% reduction in the charging time for the cell without compromising the number of cycles**

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